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SACRAMENTO DISTRICT CORPS OF ENGINEERS
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CESPK-PD-R

May 25, 1990

REPLY TO ATTENTION OF

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
San Francisco Bay to Stockton Ship Channel:
Dissolved Oxygen Mitigation Implementation

The U.S. Army Corps of Engineers proposes to install a jet aeration facility on the Stockton Deep Water Ship Channel at the Port of Stockton. This facility will mitigate for an approximate 0.2 milligram per liter reduction in dissolved oxygen (DO) which the ship channel dredging has contributed to. The ship channel dredging project was described and analyzed in the San Francisco Bay to Stockton (John F. Baldwin and Stockton Ship Channels) Interim General Design Memorandum and Final Environmental Impact Statement, September 1980. The EIS stated that post-dredging monitoring would document the dredging caused DO impacts and appropriate remedial action would be implemented.

The facility will be located on the Stockton Deep Water Ship Channel in the vicinity of Rough and Ready Island and the San Joaquin River confluence. This area is adjacent to the river reach with the greatest dissolved oxygen deficit. The jet aerator will pump air bubbles and water out through underwater pipes and be mounted on pilings so as to not create any hazards to navigation. The pump intakes will include fish screens and be designed to achieve low intake velocities in order to prevent sucking in larval or juvenile fish. The facility will be operated and maintained by the Port of Stockton. The facility will be operated whenever the DO levels at any of eight City of Stockton monitoring stations, in the river drop below 5.2 mg/l during the fall salmon run (September-November).

Alternatives considered to improve the dredging induced DO levels in the river included reducing high nutrient agricultural and urban runoff inflows, increasing water releases from upstream reservoirs and directly aerating the area of the river where dredging has reduced the DO levels. Aeration was selected as the most cost effective and appropriate mitigation method given the minor degradation induced by the dredging project.

The installation and operation of the proposed jet aeration facility at the Port of Stockton in the vicinity of Rough and Ready Island will result in no significant adverse impacts to the human or natural environments. The installation will improve water quality in the project area, therefore the preparation of an Environmental Impact Statement will not be required.

Jack A. Le Cuyer
Colonel, Corps of Engineers
District Engineer

ENVIRONMENTAL ASSESSMENT

San Francisco Bay to Stockton Ship Channel: Dissolved Oxygen Mitigation Implementation and Operation

May 1990

1. Introduction. This Environmental Assessment (EA) describes and analyzes the proposed installation of facilities to mitigate reduced dissolved oxygen (DO) levels resulting from dredging of the San Joaquin River in the vicinity of Stockton, California. The ship channel dredging project was described and analyzed in the San Francisco Bay to Stockton (John F. Baldwin and Stockton Ship Channels) Interim General Design Memorandum and Final Environmental Impact Statement: Sacramento District, September 1980. The ship channel dredging occurred between 1984 and 1987. The 1980 EIS documented pre-project channel DO levels and stated that post-dredging monitoring and modeling would document the extent of the dredging caused DO impacts and appropriate remedial action would be implemented. The post project impacts were described in the Dissolved Oxygen Study, Stockton Deep Water Ship Channel. Office Report, Sacramento District, November 1988. This EA document describes the proposed remedial action, alternatives considered, and environmental effects which could occur from the implementation and operation of the remedial action.

2. Proposed DO Mitigation Action. The post-dredging monitoring and modeling effort determined that the project reduced DO levels in the Port of Stockton area by approximately 0.2 milligrams per liter (mg/l). To raise the DO levels in the river, a jet aeration system would be installed on the Stockton Deep Water Ship Channel in the vicinity of Rough and Ready Island (U.S. Naval Communications Station, Stockton) and the San Joaquin River confluence. The facility will be designed and constructed by the Corps of Engineers, with operation and maintenance responsibilities to be assumed by the Port of Stockton.

The confluence site is adjacent to the river reach with the maximum DO deficit and is in an area with depths range from 35 to 45 feet. This facility would pump air and water through a series of submerged nozzles mounted on pilings or the piers. The jet aeration system blows large size air bubbles through a pipe beneath the water. Adjacent to these air pipes are water jets which shear the large bubbles into thousands of smaller bubbles to enhance oxygen transfer efficiency. This also pushes the aerated water laterally into the channel. Tidal flows should mix the aerated water longitudinally through the river reach with reduced DO levels. The system would have a capacity of approximately 3,000 pounds of oxygen per day. The air and water pumps would be located on the adjacent land in a fenced enclosure. The exact facility location will be determined during

the design process. The water pump intake will be screened to prevent larval and or juvenile fish from being sucked into the pumps. The screens will utilize a large surface area so that intake flow velocities will be low. The shore-based system eliminates floating equipment that could be damaged by storms, ships, small boats or vandals.

The City of Stockton conducts daily DO monitoring at eight locations in the San Joaquin River between Brandts Bridge (upstream) and Light 18 (downstream) as required by their wastewater discharge permit. When DO levels at any of these monitoring locations drops below 5.0 mg/l, the City of Stockton is required to initiate tertiary treatment at the Stockton Regional Wastewater Control Facility. Because the ship channel dredging reduced DO levels in the channel by approximately 0.2 mg/l, the aeration facility will be operated when any of the DO level monitoring locations drops below 5.2 mg/l during the fall salmon run. DO levels below 5.0 mg/l adversely effect the fall salmon runs which typically occur during September, October or November.

3. Alternatives Considered. The majority of the low DO level problems in the Lower San Joaquin River are related to nutrient rich inflows which feed phytoplankton which in turn consume much of the available oxygen in the water. The major sources of the nutrient rich inflows are from agricultural and urban area runoff and treated sewage effluent. Various alternatives were considered to reduce these inflows. However all source reduction methods were of a large and complex nature requiring multi-agency and multi-jurisdiction programs, not commensurate with the minor DO degradation the dredging has caused. Flushing the lower river with additional "clean water" from New Melones Reservoir was also considered, but was found to be ineffective due to the reverse flow regime caused by the Central Valley and State Water Project export pumping. Thus aeration was selected as the most cost effective and appropriate mitigation method given the minor degradation induced by the dredging project. The types of aeration considered included:

jet aeration
course bubble diffused aeration
mechanical surface aerators
limno-guns
cascade aeration
fine bubble diffused aeration
diffused oxygenation
rotor aerators
fountains

Given cost effectiveness, reliability, minimization of hazards to navigation, and fit to the site considerations, jet aeration was selected as the proposed mitigation method.

4. Environmental Effects of the Proposed Action. The installation and long-term operation of the jet aeration facility are expected to have few negative environmental effects.

Any pumping system such as this has the potential for destroying small fish. The intake structures will be screened and designed so as to minimize inflow velocities which could suck young fish in. The fine bubbles which the system will produce should not impede fish migration or movement. Rough and Ready Island is also outside the area of concern for the threatened Winter Chinook Salmon as identified by the National Marine Fisheries Service.

The underwater air and water pipes will be mounted on pier pilings or other pilings close to shore so as to avoid creating any hazards to navigation or to avoid damage to the aeration system from dragging anchors. This location should not impede shipping activities occurring on the piers.

The Rough and Ready Island and the Port area is an industrial area where the noise of pump and blower operation will be compatible with ambient noise levels. Electric utility service is available in the vicinity to power the pumps and blowers. Approximately 85,000 kilowatt hours of electricity will be consumed by the facility annually.

There are no National Register of Historic Places properties in the Rough and Ready or Port of Stockton area.

5. Coordination. The DO monitoring and modeling report has been reviewed by the agencies listed below. The DO mitigation plan, EA and finding will also be circulated to these agencies for review.

Port of Stockton
City of Stockton
Central Valley Regional Water Quality Control Board
California Department of Water Resources
California Department of Fish and Game
National Marine Fisheries Service
Fish and Wildlife Service
Bureau of Reclamation
Environmental Protection Agency

6. Conclusion. Based upon this analysis, the comments received from the City of Stockton, and the California Department of Water Resources on the draft EA, the installation and operation of the proposed jet aeration facility at the Port of Stockton will result in no significant adverse impacts to the human or natural environments. The installation will improve water quality in the project area. Therefore the preparation of an Environmental Impact Statement will not be required.

DISSOLVED OXYGEN MITIGATION PLAN

SAN FRANCISCO BAY TO STOCKTON SHIP CHANNEL: May 1990

Background Information

The U.S. Army Corps of Engineers, Sacramento District (Corps) deepened the Stockton ship channel between 1984 and 1987. The old depth was 30 feet below mean lower low water, and the new depth is 35 feet.

Comments from the California Department of Fish and Game (DFG) on the original 1980 Final Environmental Impact Statement expressed concern on the impact of the channel deepening project upon dissolved oxygen (DO) concentrations in the San Joaquin River (SJR) waters near the Port of Stockton. These waters serve a salmon run during the fall, and at this time it becomes important to hold the minimum DO concentration at 5.0 mg/l.

The Corps and the DFG concurred that a mathematical modeling study of DO in the SJR would be a suitable effort to determine impacts on DO levels due to channel deepening. Actual DO concentrations in the affected reach are already being monitored by both the California Department of Water Resources (DWR) and the City of Stockton. It was felt that the number of variables affecting DO are so many that separation of impacts due to the channel deepening would be difficult to do solely by analysis of monitoring data. With a calibrated mathematical model all variables can be held constant and only channel depth changed to determine its effects.

The Corps issued a contract to the environmental modeling firm of Resource Management Associates (RMA) to model the DO in SJR. The RMA effort modeled both pre-and post-project conditions. The results indicate that the project deepening under a variety of hydrologic conditions would lower DO concentrations by about 0.2 mg/l. To mitigate for the project impact of 0.2 mg/l would require a mass input of 625 pounds (lbs.) oxygen/day under near-zero net flow conditions in the project area of SJR to 2,500 lbs. oxygen/day when the net downstream SJR flow in the project area approaches 2,000 cfs.

To relate the RMA findings to other studies and findings that were conducted by other agencies over the years, and to present additional data and information deemed pertinent to the study, the Corps prepared an Office Report in November 1988. Further details of the Corps Office report and the RMA study are available from the Sacramento District of the Corps of Engineers. These reports were sent to the following agencies for their review and comment:

a. U.S. Fish and Wildlife Service
b. U.S. Bureau of Reclamation
c. Central Valley Regional Water Quality Control Board
d. California Dept. of Water Resources
e. California Dept. of Fish and Game
f. Port of Stockton
g. City of Stockton

A meeting with the above agencies was held in January 1989 to discuss the written comments received on the documentation reports. At the meeting the Corps pointed out that it could only mitigate for its dredging induced effect of 0.2 mg/l. All agreed the DO demand at Stockton is due to a multitude of factors, and the present channel deepening is only one of these factors. Following this meeting, the Corps provided written responses to the comments of each agency. Based on evaluation of meeting results and discussion with several agencies, and at the urging of the U.S. Fish and Wildlife Service (USFWS), the district recommends proceeding with mitigation for the channel deepening effects.

Mitigation Plan

The Corps conducted a literature search on the various methods of channel aeration. During this search, a review was made of the DO mitigation plan of the Texas Water Commission/City of Houston (Espey, Huston & Associates, Final Report, 1988) for the Houston Deep Water Ship Channel. In that study a worldwide literature search and examination of in-place aeration facilities was done. The mitigation method recommended in that study was a jet aeration system. Because of similarities between Stockton and Houston conditions, this district recommends a jet aeration system be installed on the Stockton Deep Water Ship Channel in the vicinity of Rough and Ready Island (U.S. Naval Communications Station, Stockton) and the San Joaquin River confluence.

As a result of coordination with the Navy and the Port of Stockton, the aeration facility will be located on either bank of the San Joaquin River at the confluence with the Deep Water Ship Channel. Figure 1 is a map of this area. The water depth in the confluence vicinity ranges from 35 to 45 feet deep, thus no additional dredging would be required for the installation of the aeration facility. Rough and Ready Island is also adjacent to

the reach of maximum DO deficit. The shore-based system eliminates floating equipment that could be damaged by storms, shipping, recreational boating, or vandalism.

The jet aeration system chosen blows large-size air bubbles through a pipe beneath the water. Adjacent to these air pipes are water jets which shear the large bubbles into thousands of smaller bubbles to enhance oxygen transfer efficiency. The action of the jet aeration system pushes the aerated water laterally into the channel. This induces horizontal and vertical mixing so that additional benefit is derived from aerated surface water mixed downward. The large air pipes of the jet aeration system result in lower maintenance costs than other aeration systems that directly produce smaller diameter air bubbles under the water surface.

The Corps proposes to construct one jet aeration facility. A schematic drawing of the system is shown in Figure 2. Under normal hydrodynamic conditions one site will aerate a 4 to 6 mile length of the channel because of the tidal excursion that occurs past the aeration site. The system will have an oxygenation capacity of 3,000 lbs. oxygen/day, and will be operated during the fall salmon run period when DO falls below 5.2 mg/l (typically September, October and November). The aeration facility will be operated and maintained by the Port of Stockton.

This mitigation plan and an accompanying Environmental Assessment were circulated during February 1990 among the above listed agencies as well as the National Marine Fisheries Service, and the Environmental Protection Agency. No significant comments were received during the review period. Therefore a Finding of No Significant Impact (FONSI) has been prepared and the final siting and design of the aeration facility will commence. Questions or comments may be directed to is Mr. Eric Polson (916-551-2054), the San Francisco Bay to Stockton Ship Channel Project Manager.

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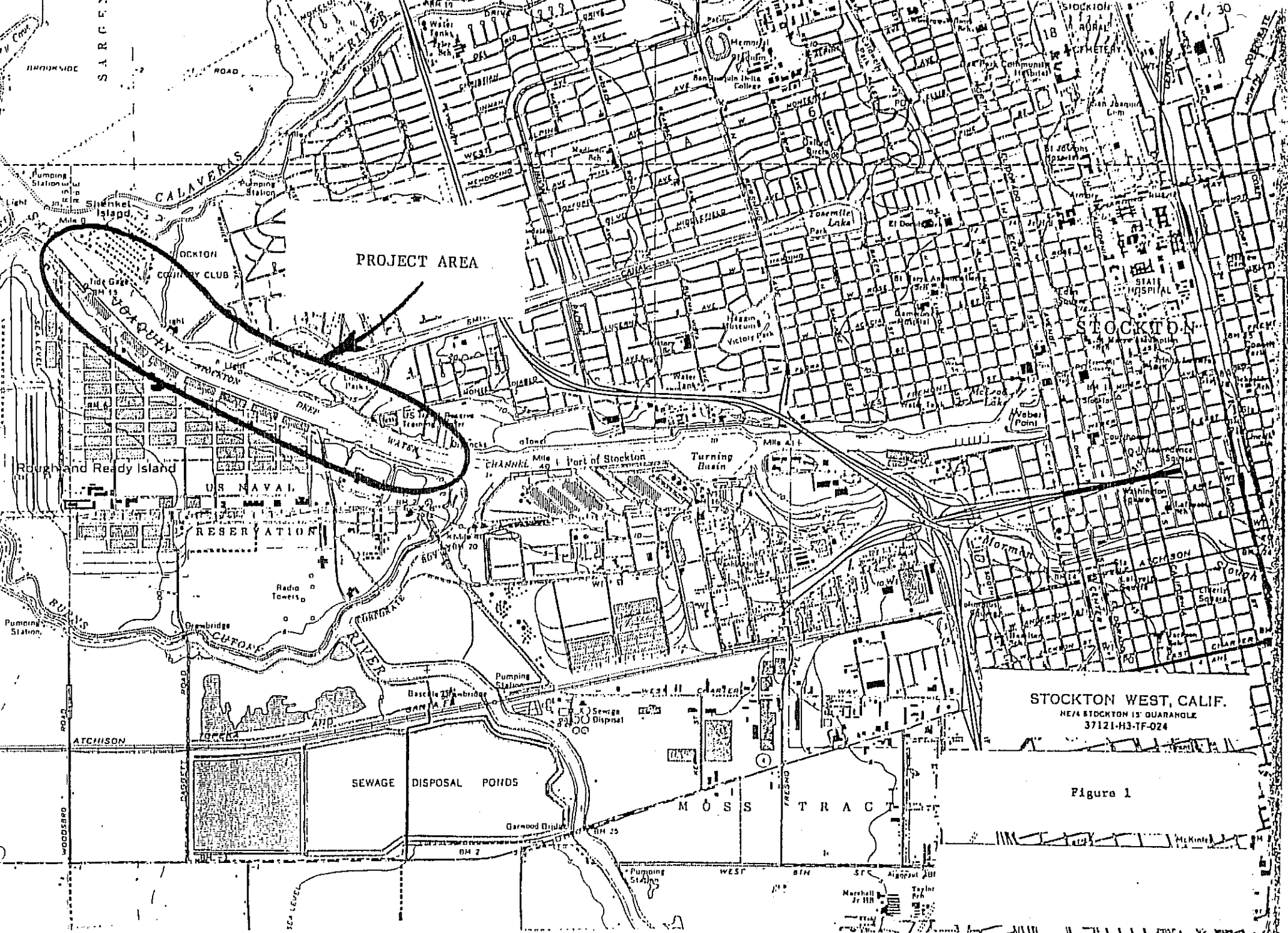
PROJECT AREA
STOCKTON
Rough and Ready Island
US NAVAL
RESERVATION
SEWAGE DISPOSAL PONDS
MOSS TRACT
STOCKTON WEST, CALIF.
NE/4 STOCKTON 15' QUADRANGLE
37121-H3-TF-024

Figure 1

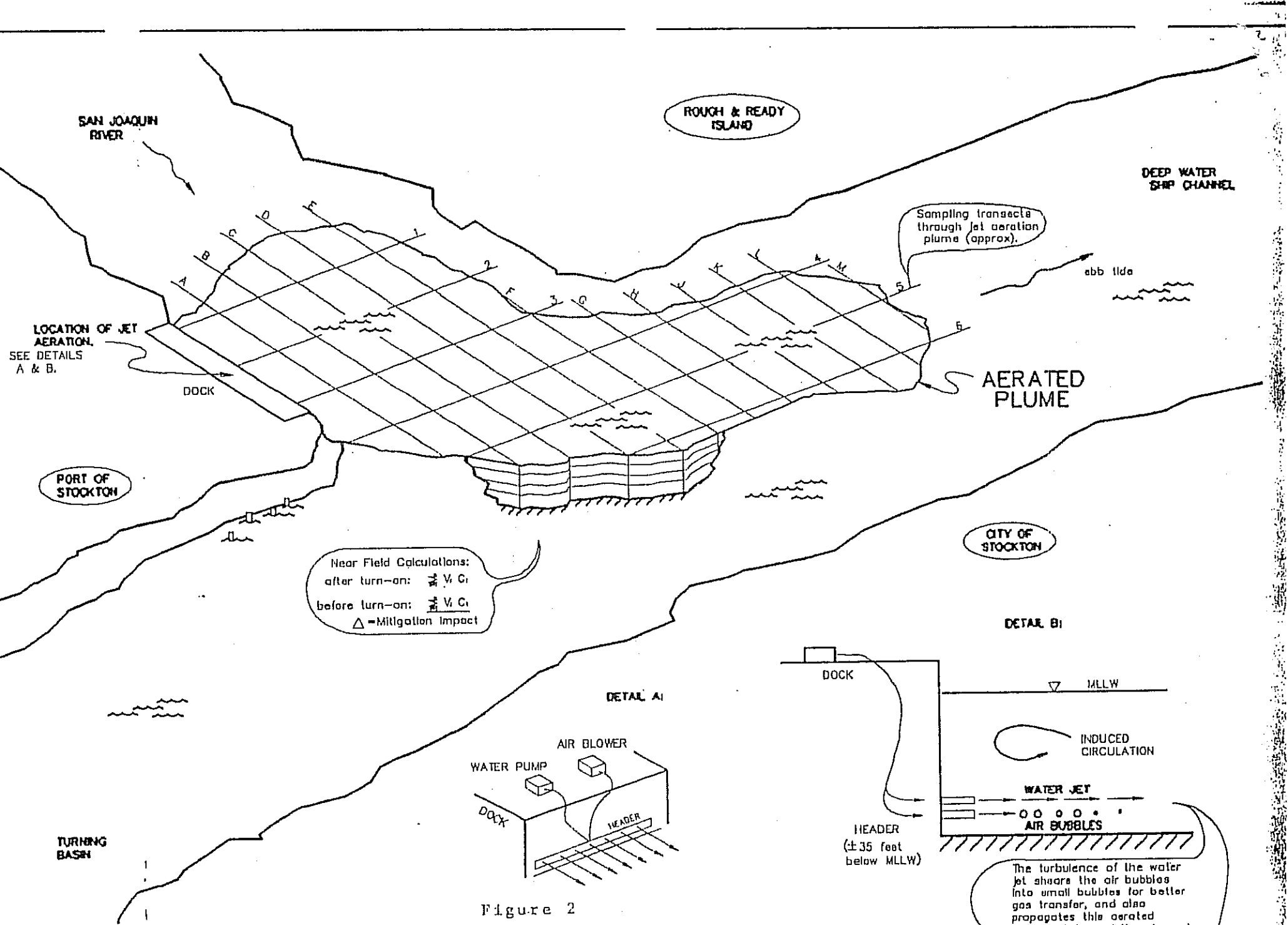

Figure 2

SCHEMATIC OF JET AERATION